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# MADROÑO

A WEST AMERICAN JOURNAL OF  
BOTANY



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# MADROÑO

## A WEST AMERICAN JOURNAL OF BOTANY

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NOTES ON THE SCUTELLARIAE OF WESTERN  
NORTH AMERICA

CARL EPLING

The Scutellariae of Western North America are members of that species-group or section known as *Galericularia*. One exception, closely allied, is *Scutellaria lateriflora*. They are characterized by a low herbaceous habit, creeping rootstocks which in two species form tubers, leaves which are sessile or short-petioled and flowers which are solitary in the axils of the upper diminished leaves, each such pair flowering consecutively. *Galericularia* is not confined to the area under consideration in this paper but is predominantly a circumpolar group of species, some members of which have ventured into the tropics of both hemispheres. The relationships which exist between the species of North America and Northern Eurasia are close.

Of the eleven species treated in this paper five, (*Scutellaria galeculata*, *S. nana*, *S. tuberosa*, *S. Bolanderi* and *S. lateriflora*) are readily differentiated. At least two of these, *S. galeculata* and *S. Bolanderi*, appear to have very close alliances with species of the Old World. The remaining six, however, form a complex less readily analyzed. While they may be differentiated by dissimilar ranges, they are separable chiefly upon the summation of several characteristics. The six species mentioned fall into two categories if the conformation of the corolla be taken into account. *Scutellaria californica*, and *S. antirrhinoides* are characterized by a corolla in which the lower lip is appressed to the laterals along their entire length, thus completely closing the tube, somewhat after the manner of a common snapdragon. The habit of *S. californica* and *S. antirrhinoides* is very similar but the corollas differ in size, conformation and color. The pubescence is very similar in both. In fact, without the corollas present, I doubt whether many individuals could readily be identified. The remaining four species (*S. angustifolia*, *S. siphocampyloides*, *S. Austinae* and *S. Brittonii*) may readily be distinguished from the first category by reason of the fact that the lower lip is more gaping and not appressed to the laterals, or if so, only in their lower parts. The throat is accordingly yawning and the orifice is distinctly perceptible in living specimens. The four are possessed of flowers which are hardly distinguishable but differ among themselves in a summation of vegetative characteristics and pubescence. For this reason they have been in the past commonly referred to *S. angustifolia* (the eldest name). If one considers morphological resemblance, particularly of the flower parts, to be the chief criterion for specific designation, such a course may very well be followed and the four species or

forms referred to as varieties or subspecies of *S. angustifolia*. But the dissimilarities of habit and pubescence are so marked and of such a degree of constancy and the ranges so distinct as to suggest that each of these forms is segregated to such an extent that interbreeding takes place little or not at all. I have accordingly preferred to accord them specific recognition, particularly in view of the fact that other authors have already done so. To treat them as varieties or subspecies would present no advantage and would result only in a multiplication of names. As far as one may judge from the evidence at hand, present hybridization is infrequent and not a factor in obscuring differentiation.

KEY TO THE WESTERN NORTH AMERICAN SPECIES OF SCUTELLARIA

- Galea and tube of corolla 5-7 mm. long ..... 1. *S. lateriflora*  
 Galea and tube of corolla 12-33 mm. long.  
 Leaves all truncate-cordate at base and (unless the lowermost, which are soon deciduous) subsessile, on petioles usually 1-3 mm. long, their margins regularly crenate-serrate.  
 Lower lip and throat of blue corolla glabrous; pubescence of stems downwardly curled, rarely wanting ..... 4. *S. galericulata*  
 Lower lip and throat of whitish corolla pilose; pubescence of stems spreading, rarely wanting ..... 5. *S. Bolanderi*  
 Leaves rarely truncate-cordate, such usually only the lowermost, borne on petioles usually .5-3 cm. long (6 mm. in *S. nana*) at base of stem and diminished upwards.  
 Long pair of stamens attached 4.5-10 mm. above base of corolla (rarely 11-12 mm. in *S. antirrhinoides* and *S. tuberosa*); lower lip of corolla appressed to laterals most of their length, closing orifice.  
 Stems and calyces more or less villous with rather stout spreading hairs ..... 2. *S. tuberosa*  
 Stems and calyces pubescent with short curled hairs and often with small spreading capitate-glandular ones as well.  
 Hairs of stem curled downwards (see also *S. siphocampyloides* and *S. antirrhinoides*) ..... 3. *S. nana*  
 Hairs of stem curled upwards, rarely wanting.  
 Long stamens attached 5-6 mm. above base of corolla tube; corolla white with blue lower lip; flowering calyx 4-5 mm. long ..... 6. *S. californica*  
 Long stamens attached 7-12 mm. above base of corolla tube, rarely 5-6 mm. in smallest flowers; corolla violet-blue, lower lip mottled; flowering calyx 3-4 mm. long ..... 7. *S. antirrhinoides*  
 Long pair of stamens attached 11-15 mm. above base of corolla tube; corolla deep violet throughout; orifice of throat open.  
 Throat and lower lip of corolla glabrous, a few long hairs scattered in tube; con-



spicuous veins of median leaves 5-7;  
plants of the Rocky Mountains .....

9. *S. Brittonii*

Throat and lower lip of corolla pilose; conspicuous veins of median leaves commonly 3-5, not prominent; plants of the Pacific Coast.

Stems and leaves pubescent with curled hairs usually mixed with short capitate glands; median leaves predominantly widest at middle, oblong, averaging about one-fifth as wide as long; plants usually 30-40 cm. tall, lax; plants of the Sierra Nevada and South Coast Ranges .....

10. *S. siphocampyloides*

Stems and leaves puberulent with minute more or less appressed hairs or wholly glabrous, rarely (in the vicinity of adjacent Idaho, Washington and Oregon) covered with capitate glands only.

Median leaves usually tapering, widest below middle, usually about one-third as wide as long; plants of Oregon, Washington and Northern Idaho .....

8. *S. angustifolia*

Median leaves usually widest about middle, oblong, averaging about one-seventh wide as long, mostly 3-4 mm. wide or less; plants of California .....

11. *S. Austinae*

1. *SCUTELLARIA LATERIFLORA* L., Sp. Pl. 598. 1753, based upon a specimen collected in Virginia by Clayton; the type, formerly in the Gronovian Herbarium, is in the British Museum.

This species is infrequent in the west where its distribution, particularly in the southwest, would appear to be relictual. It is rarely quite glabrous, being usually appressed-hirtellous along the angles of the stems; in the eastern part of its range, but apparently nowhere in the west, a form occurs with small spreading capitate glands.

Following is its known distribution in the western states. BRITISH COLUMBIA. Chilliwack Valley, Vancouver Island, New Westminster. WASHINGTON. Whatcom County: Deming, McCloud Lake. Okanogan County: Loomiston. Stevens County: Mission, Meyer's Falls. Snohomish County: Marysville. Pierce County: Tacoma. Lewis County: Chehalis. Grays Harbour County: Grays Harbour. IDAHO. Bonner County: Priest River Valley, Priest Lake, Upper Priest Lake, Granite. Kootenai County: Valley Coeur d'Alene River, O'Gara, Lake Coeur d'Alene, Fernan Lake. Shoshone County: Old Mission Peak. Benewah County: St. Maries. OREGON. Columbia County: Clatskanie. Washington County: Forest Grove, Hillsboro. Multnomah County: Portland, Sauvie Island, Cascades. Clackamas County: Oregon City. Marion County: Orville, Brooks, Salem. Lane County: Wendling Road, Triangle Lake. CALIFORNIA. San Joaquin County: Bouldin Island. ARIZONA. Yavapai County: Beaver Creek, Oak Creek, Aultman, Camp Verde.

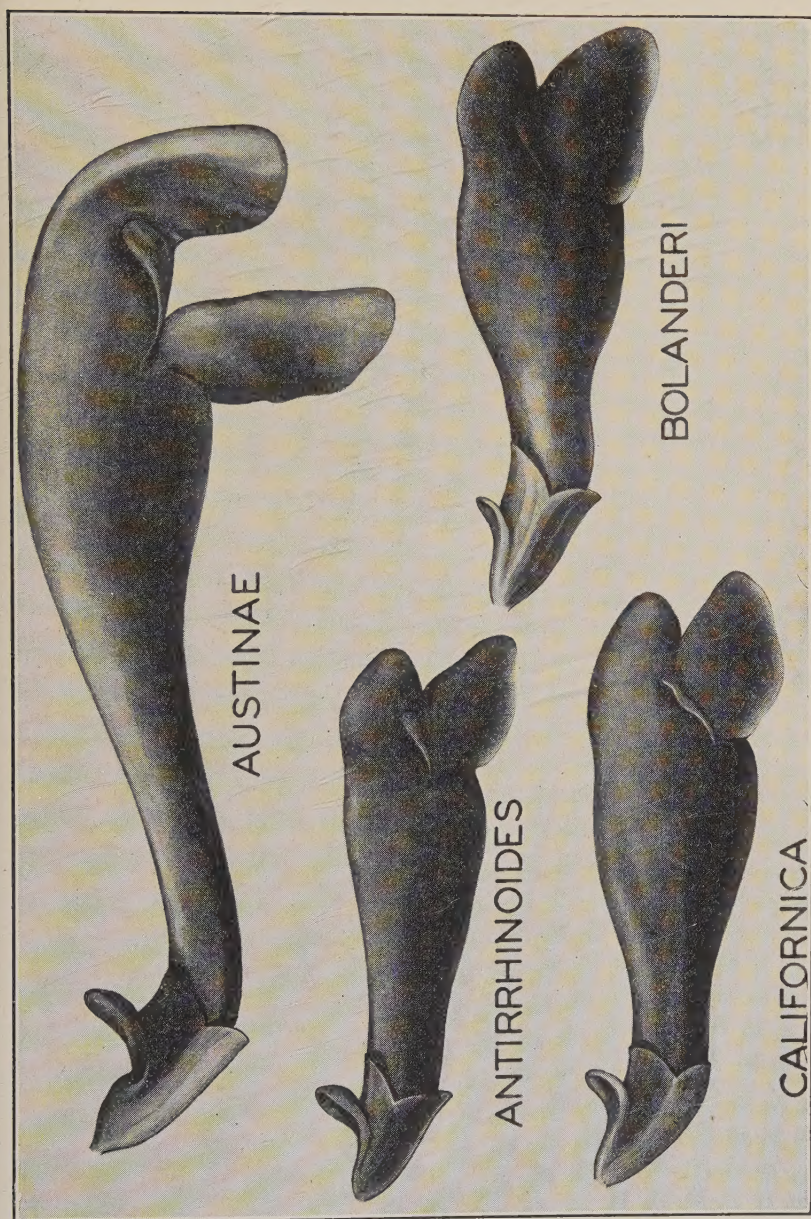
2. *SCUTELLARIA TUBEROSA* Benth., Lab. Gen. et Sp. 441. 1834, based upon a specimen collected in California probably near Monterey by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

A perennial herb creeping with tuberiferous rhizomes and sometimes forming mats; stems 5–20 cm. tall, usually branched at the base and generally viscid with rather long spreading hairs, rarely subglabrous; leaf-blades ovate, mostly 1–2 cm. long, coarsely dentate, rarely subentire, viscid-villous with rather long hairs on both surfaces, the lower borne on petioles .5–1.5 cm. long, those of the median and upper leaves gradually diminished; flowers solitary in the axils, produced nearly to the base of the plant, borne on pedicels 2–3 mm. long; flowering calyces pilose, the lower lip 4–6.5 mm. long, 6.5–7.5 mm. long at maturity, the squama then 3.5 mm. tall, plane, not usually impressed; galea and tube of the blue corollas 12–21 mm. long; lower stamens seated near the middle of the tube; nutlets black, irregularly and coarsely toothed.

*Scutellaria tuberosa* may be differentiated into two subspecies. The first occurs in the foothills of the Sierra Nevada and Cascade ranges from Mariposa County, California, northward as far as Grants Pass, Oregon, thence southward along the north coast ranges to Marin County, California. It corresponds largely but not wholly to *S. tuberosa* var. *similis* of Jepson, which was based upon the more pilose calyx. The second occurs primarily in coastal southern California from Santa Barbara southward to Santo Tomas in Lower California. It also occurs sporadically north to Alameda and Santa Clara counties, California. In the vicinity of San Francisco Bay and southward to Lompoc the two subspecies appear to merge, the intermediates being more abundant than the subspecies themselves. Both subspecies flower at about the same time, chiefly in April and May. The following key will serve to differentiate the subspecies:

- |  |   |
|--|---|
| Palate pilose, tube glabrous within below middle, lower lip broader than long, 3.5–5.5 mm. long, averaging about 4.5 mm., 5–8 mm. broad, averaging about 6.5 mm.; tube and galea 15–20 mm. long, averaging about 18 mm.; tube below point of insertion of lower stamens 6–10 mm. long, averaging about 8 mm. long; lower stamens 8–11 mm. long, averaging 9.5 mm. long, therefore usually exceeding lower part of tube .....             | <i>S. tuberosa</i><br>subsp. <i>similis</i>   |
| Palate glabrous, tube hairy within below middle, even annulate, lower lip about as broad as long, 4–6 mm. long, averaging about 5 mm., 4.5–7.5 mm. broad, averaging about 5 mm., galea and tube 17–21 mm. long, averaging about 19 mm., tube below the place of attachment of stamens 10–12 mm. long, averaging about 10.5 mm.; lower stamens 7–10 mm. long, averaging about 9 mm. long, therefore shorter than lower part of tube ..... | <i>S. tuberosa</i><br>subsp. <i>australis</i> |



PLATE 6. COROLLAS OF FOUR SPECIES OF SCUTELLARIA,  $\times 4$

The intermediates lean more nearly towards *S. tuberosa* subsp. *similis*. A form with the corolla wholly glabrous both on the palate and within the tube has been recorded from four widely separated localities throughout the range. The descriptions of the subspecies together with their occurrence follow:

2a. *SCUTELLARIA TUBEROSA* subsp. *similis* comb. nov. per *S. tuberosam* var. *similem* Jepson, loc. cit. constituta est.

*Scutellaria tuberosa* var. *similis* Jepson, Fl. W. Middle Calif. 454. 1901, based on specimens collected near Calistoga, Napa County, California.

Calycibus extus saepius pilosioribus; corollarum faucibus pilosis et tubo glabro, galea cum tubo 15–20 mm. longo, tubo infra stamina inferiora 6–10 mm. longo; staminibus inferioribus 8–11 mm. longis itaque partem tubi inferiorem paulo superantibus.

The distribution of this subspecies is predominantly between 1000 and 2000 feet. OREGON. Jackson County: Wimer, Evans Creek, Central Point. Josephine County: Grants Pass, Williams Creek, Galice (Alameda Mine), Kirby. CALIFORNIA. Mariposa County: Kinsley, Mariposa. Tuolumne County: Groveland, Indian Creek, Columbia. Calaveras County: Mokelumne Hill, Avery, Angels Camp. Amador County: Jackson, Ione, Jones Butte, New York Falls. Eldorado County: Pacific House. Placer County: Forest Hill. Nevada County: Nevada City, Moores Flat. Sutter County: Marysville Buttes. Yuba County: Dobbins. Butte County: Little Chico Creek, Big Chico Creek. Plumas County: Indian Valley. Lassen County. Shasta County: Olinda, Cow Creek Canyon. Siskiyou County: Sisson. Humboldt County: Phillipsville, Buck Mountain, Willow Creek, Van Duzen Valley, Hupa, Garberville. Mendocino County: Idol House, Albion River, Longvale. Glenn County: Alder Spring Road. Lake County: Bendmore Valley, Waldon Valley, Burns Valley, Scott Valley, Mount Hannah, Bartlett Springs, Kelseyville. Napa County: Pope Valley, Niebaum's Dam. Sonoma County: Geysers, Petaluma. Marin County: Mount Tamalpais. Contra Costa County: Mount Diablo. Santa Clara County: Smith Creek at foot of Mount Hamilton.

2b. *SCUTELLARIA TUBEROSA* subsp. *australis* subsp. nov. per specim. classicum Douglassianum constituta est; typum in herb. Kew. vidi.

*Scutellaria pilosiuscula* Nutt. ex Benth. in DC. Prodr. 12: 429. 1848 (nomen nudum).

Corollarum faucibus glabris et tubo intus infra medium plus minusve piloso saepius annulato, galea cum tubo 17–21 mm. longo, tubo infra stamina inferiora 10–12 mm. longo; staminibus inferioribus 7–10 mm. longis itaque quam pars tubi inferior paulo brevioribus.



The distribution of this subspecies together with the intermediates lies predominantly below 1000 feet. CALIFORNIA. Alameda County: Oakland, Piedmont, West Berkeley, Berkeley, Lake Temescal, Mills College, Lake Chabot. Santa Clara County: Alum Rock Park, Stanford University. Santa Cruz County: Ben Lomond. Monterey County: Pacific Grove, Watsonville, Carmel. Santa Barbara County: Santa Barbara, Carpinteria, Gaviota Pass, Santa Cruz Island. Ventura County: Ojai. Los Angeles County: Westwood, Santa Susanna Pass, Boney Ridge, Pomona, San Dimas, San Gabriel, Sepulveda Canyon, Mandeville Canyon, Claremont, Glendora, San Gabriel Canyon, Verdugo Hills, Griffith Park. San Bernardino County: Devore, San Bernardino, Rialto. Riverside County: Murietta. San Diego County: Lion's Valley, Anahuac School, Barrett, Potrero, Springhill School, Ramona, Santa Isabel, Dehesa, Palomar Mountain, Jamul, Witch Creek, Descanso, Kearney Mesa, Otay Mountain, La Mesa. BAJA CALIFORNIA. Vallecito, Santo Tomas.

The intermediate forms with hairy palate and more or less hairy tubes have been found as follows (some are *Scutellaria tuberosa* var. *similis* Jepson in respect to the hairy calyx). CALIFORNIA. Mendocino County: Ukiah. Colusa County: College City. Napa County: Howell Mountain, Napa. Contra Costa County: Mount Diablo, Moraga Ridge. Alameda County: Woolsey Canyon, Berkeley, Alameda, San Antonio Creek, Hayward, Mills College, Temescal. San Joaquin County: Live Oaks. San Mateo County: Jasper Ridge, Belmont, Crystal Springs Lake. Santa Clara County: Los Gatos, Mount Hamilton, Stanford University. Santa Cruz County: Loma Prieta, Scott Valley to Felton, Santa Cruz, Swanton. San Benito County: San Juan Rocks, Paicines. Monterey County: Pacific Grove, Carmel River. Madera County: 16 miles east of Madera. Tulare County: Bear Creek, Milo. San Luis Obispo County: Price Canyon, Templeton, Asuncion. Santa Barbara County: Refugio Pass (Lompoc). Los Angeles County: uncertain locality.

The form with a glabrous corolla has been found as follows. CALIFORNIA. San Diego County: Santa Isabel. Tulare County: North Tule River. San Luis Obispo County: San Luis Obispo. Mendocino County: Round Valley.

3. *SCUTELLARIA NANA* Gray in Proc. Amer. Acad. 11: 100. 1876, based upon a specimen collected in Nevada in Winnemucca Valley near Pyramid Lake by Lemmon; the type is in the Gray Herbarium.

*Scutellaria Footeana* Mulford in Bot. Gaz. 19: 118. 1894, based upon a specimen collected in Idaho in Black Canyon by Mulford; authentic material is in the Gray Herbarium and herbarium of the Missouri Botanical Garden.

A small herb 5–15 cm. tall, creeping by rhizomes which sometimes form slender tubers; stems branching at the base, slender tufted, cinereous with short curving retrorse hairs; leaf-blades quite entire, for the most part oblong-elliptical, 1–1.5 cm. long, 3–6 mm. broad, obtuse at both ends, frequently ovate or oval, even subrotund and as much as 12 mm. in diameter, borne on petioles 1–5 mm. long, both surfaces equally ashy with small curved retrorse hairs; flowers axillary, produced nearly to the base of the plant; flowering calyces 3.5–5 mm. long, cinereous with short curved retrorse hairs, lower lip 5.5–6 mm. long at maturity, upper lip 3.5 mm. tall, squama concave; corolla tube usually yellowish (rarely blue), glabrous within and pilose only on the palate, galea usually purplish, both together 16–20 mm. long, usually about 17.5 mm., lower lip appressed to the laterals; lower stamens attached near middle of tube; nutlets black, strongly verrucose and somewhat angled but hardly banded.

This species may be readily segregated from any other related entity, such as *Scutellaria antirrhinoides* by the retrorse and eglandular pubescence (one glandular exception is known). The proportions of the corolla, particularly of the lower lip, and the relation of the stamens to it are also distinctive. The color of the corolla is usually yellowish, being reported as “dull” or “greenish” yellow. The upper lip may sometimes be tinged with purple, or the whole corolla may be blue, as in the forms of eastern Nevada. These were confused by Leonard with *S. antirrhinoides* (*S. nevadensis*). The nature of the pubescence and conformation of the corolla, as well as leaf shape, suggest a relationship with *S. nana*. *S. Footeana* of Idaho is seemingly also conspecific, although known only from a single collection. The corolla of that was described as yellow, becoming orange on the lobes. There is considerable variation in habit, but available material is insufficient to determine whether it has geographic significance.

In California and Oregon the species occurs either with yellow pine, or yellow pine and juniper, lodge-pole pine or *Artemisia tridentata*, mostly above 4000 feet. It flowers chiefly in June, July, and August. A blue-flowered specimen collected by Keck was found in the juniper-piñon climax (Nye County, Nevada). An anomalous glandular form was collected in Lassen County near Amedee by Jones. IDAHO. Gem County: Black Canyon. NEVADA. (cyaniflorae) Nye County: Currant. White Pine County: Schellbourne, Ely. (flaviflorae) Washoe County: pass between Soda Valley and Warm Springs near Pyramid Lake (type locality), Wadsworth. OREGON. Deschutes County: Paulina Lake, Bend. Crook County: Hay Creek, Laidlaw, Lapine, Farewell Bend. Klamath County: Klamath Falls, Lost River. Lake County: Lakeview, Fremont Valley, Hart Mountain, Fossil Lake, Pine Lake, Goose Lake Valley. Harney County: Harney



Valley, Drewsey, Riley. Malheur County: Steens Mountains (Huffman's), Malheur to Barren Valley. CALIFORNIA. Siskiyou County: Bray, Igerna, Weed, Edgwood, Caldwell Butte, Lava Beds National Monument. Shasta County: Lava Beds, Burney Spring. Modoc County: Bieber Range, 4500 feet, Warner Range, 5000-6500 feet, Alturas, Hackamore, Mount Bidwell, 6000 feet, South Fork Pitt River, Joseph Creek. Lassen County: Pine Creek, Lassen National Forest. Plumas County: Lassen Buttes, 6000 feet, Chester, 5000 feet.

4. *SCUTELLARIA GALERICULATA* L., Sp. Pl. 599. 1753.

*Scutellaria epilobiifolia* Hamilton in Ann. Soc. Linn. Lyon 1: 32. 1832.

Following Fernald (*Rhodora* 23: 86. 1921) the American form of this species has been frequently referred to as *S. epilobiifolia*. The matter is not as simple as it appears at first glance, for while there is a difference between our form and its homolog of western Europe, some forms of eastern Europe and Siberia are indistinguishable from the American and are confluent with the typical form. In North America the species is stable save in Oregon and Washington. These facts will be discussed in a later paper.

5. *SCUTELLARIA BOLANDERI* Gray in Proc. Am. Acad. 7: 387. 1868, based upon a specimen collected in Mariposa County, California near Clark's Meadows (Wawona) by Bolander (no. 5006); the type is in the Gray Herbarium.

A perennial herb generally 20-40 cm. tall, spreading by slender rhizomes, its stems lax, branching chiefly in the lower nodes or simple, villous with spreading but not straight hairs half the diameter of the stem or longer, often viscid; leaves generally crowded, the blades of the lowermost 1-2 cm. long, deltoid-ovate, borne on slender petioles 5-10 mm. long, the median and uppermost subsessile, usually equalling or surpassing the internodes, gradually diminished above and ovate-oblong, 2-5 cm. long, 1-2.5 cm. broad, rounded or obtuse at the apex, subtruncate at the base, all save the uppermost coarsely crenate-serrate and sparingly villous; flowers solitary, few; flowering calyces 4.5 mm. long, sparingly villous with spreading more or less glandular hairs, the lower lip 5-6 mm. long at maturity, the squama about 3 mm. tall, concave; corolla white, clothed with spreading glandular hairs, the combined tube and galea 12-18 mm. long, the palate strongly pilose, violet, the tube somewhat pilose within but glabrous below the middle, lower lip appressed to the laterals; lower stamens attached somewhat below the middle of the tube, the free portion of the filaments 7-11.5 mm. long, the portion of the tube below their attachment 4.5-7 mm. long; nutlets smoky, verrucose, banded.

Although this species ranges widely in California it is highly

localized and not frequently collected. It occurs in the valley woodland and yellow pine—white fir or yellow pine—Douglas fir associations, mostly between 1000 and 4000 feet, in wet meadows and along the gravelly or sandy margins of living streams. The forms of the Sierra Nevada differ from those of southern California in the size and coloring of the corolla. The species flowers chiefly in July and August.

5a. *SCUTELLARIA BOLANDERI* subsp. *typica* subsp. nov. per specimen classicum Bolanderi constituta est.

Corollae tubo cum galea 16–18 mm. longo filamentis inferioribus 9–11.5 mm. longis supra tubi basim 6–7 mm. positis, labia inferiore saepius irregulariter violaceo-maculata.

The range of this subspecies is as follows. CALIFORNIA. Plumas County: Indian Valley. Amador County: Waterman, Plymouth, Jackson. Calaveras County: Angel's Camp, Calaveras Grove, Mokelumne Hill. Tuolumne County: Indian Creek, John Gillam Gulch (near Rawhide). Mariposa County: Mariposa, Wawona (Clark's Meadow). Madera County: Coarse Gold, Whiskey Creek. Fresno County: Sequoia Mills, Tollhouse. Tulare County: Kaweah River bottom, Eshom Valley, Giant Forest, Three Rivers. Kern County: Poso Creek Valley.

5b. *SCUTELLARIA BOLANDERI* subsp. *austromontana* subsp. nov. per specim. ad rivulum Carrizo dictum prope Lake Henshaw a Gander (no. 2739) lectum constituta est; typum in herb. Univ. Calif. vidi.

Corollae tubo cum galea 12–15 mm. longo, filamentis inferioribus 7–10 mm. longis supra tubi basim 4.5–6 mm. positis, labia inferiore saepius aequaliter violacea nullomodo maculata.

This subspecies ranges as follows. CALIFORNIA. San Bernardino County: Mojave River, Victorville. Riverside County: Idylwild. San Diego County: Palomar Mountain, Japatul Valley, Green Valley, Morena, meadow below Cuyamaca Lake, Viejas, Carrizo Creek near Lake Henshaw. A single specimen without flowers but assuredly referable to *S. Bolanderi* has been collected in Santa Clara County along Uvas Creek near Bradley's Store. I was unable to find it there.

6. *SCUTELLARIA CALIFORNICA* Gray, Syn. Fl. N. Am. 2: 381. 1878, based upon *S. antirrhinoides* var. *californica*, loc. cit.

*Scutellaria antirrhinoides* var. *californica* Gray in Proc. Amer. Acad. 8: 396. 1873, based upon several Californian collections; I consider Bolander's specimen from Anderson Valley as the standard.

*Scutellaria Bolanderi* var. *californica* Penland in Rhodora 26: 68. 1924, based upon the same.

A perennial herb usually 15–25 cm., rarely 30 cm. tall, spreading by rather thickish rhizomes; stems usually branching at base, puberulent with upwardly curved hairs amongst which





small spreading capitate glands frequently occur; blades of lowermost deciduous leaves ovate, 1-1.5 cm. long, crenate-serate, borne on petioles .5-2 cm. long, those of the upper gradually diminished, lower leaves subcrenate, the upper oblong-elliptic and entire, subsessile, the median 1.5-3.5 cm. long, 6-12 mm. broad, all pubescent with upwardly curved hairs and usually glandular; flowers axillary, borne mostly above the middle of the plant, pedicels 3 mm. long; lower lip of calyx 4-5 mm. long at flowering, 6 mm. long at maturity, squama then 3.5-4 mm. tall, concave; corolla whitish, its galea and tube 14-21 mm. long, lower lip appressed to laterals; lower stamens seated below middle of tube; nutlets black, verrucose, obscurely banded.

In the field this species is readily distinguished by its whitish corolla except in what are apparently rare cases of albinism in other species. However, this is the only single difference I have found which may be advanced to distinguish this species from *S. antirrhinoides*. In habit and pubescence it is almost identical with that species and in the conformation of its corolla approaches it closely. The nutlets of both are similar, and the range of variation in each is such as to preclude any certain differentiation on these grounds. Measurements of the length and breadth of median leaves (generally the lowermost floral leaves) give almost identical averages, as may be seen from the figure. Only in the conformation of the corolla and particularly the position of the lower stamens with reference to the base of the corolla tube do the averages show a significant hiatus. Even here the extremes of *S. antirrhinoides* include those of *S. californica*. The differences show most clearly in the maximum size corollas; these and the averages may be compared in the figure. In respect to corolla conformation *S. californica* is also very similar to *S. Bolanderi*.

The pubescence as viewed with a lens is usually not glandular although some specimens show a marked sprinkling of slender small capitate glands. As viewed under a compound microscope these glands are usually present in some degree.

The area occupied by *S. californica* is much more restricted than that of *S. antirrhinoides*. It ranges along the Sierran foothills from Tuolumne County northward to Siskiyou County thence southward in the north coast ranges to Alameda County, being found from almost sea-level in the coastal counties to 6500 feet in the Sierra Nevada. It occurs almost wholly within the southern limits of *Pseudotsuga taxifolia*, both in the Sierran and Coastal forests, growing in seepage spots and on banks above streams or along the streams themselves. The species flowers during June and July.

The area occupied may be learned by reference to the map. Following is its distribution by counties: CALIFORNIA. Tuolumne; Calaveras; Amador; El Dorado; Placer; Nevada; Yuba; Butte;



Plumas; Siskiyou; Humboldt; Tehama; Mendocino; Lake; Sonoma; Napa; Marin; Solano; Alameda.

7. *SCUTELLARIA ANTIRRHINOIDES* Benth. in Lindl. Bot. Reg. 18: pl. 1493. 1832, based upon a specimen collected by Scouler along the banks of the Columbia River near Ft. Vancouver; the type is in the herbarium of the Royal Botanic Gardens at Kew.

*Scutellaria viarum* Heller in Muhlenbergia 1: 32. 1904, based upon a specimen collected by Heller (no. 5786) along the banks of the Russian River near Windsor, Sonoma County, California; the actual type is unknown to me.

*Scutellaria sanhedrensis* Heller in Muhlenbergia 1: 31. 1904, based upon a specimen collected by Heller (no. 5894) at Summit Lake on Mount Sanhedrin in Lake County, California; the actual type is unknown to me.

*Scutellaria nevadensis* Eastwood in Bull. Torr. Bot. Club 30: 492. 1903, based upon a specimen collected in Nevada in Elko County in Little Lakes Canyon (Western Stampede) by Beveridge (no. 546); the type is in the Herbarium of the California Academy of Sciences, isotypes are in the herbaria of the University of California and the New York Botanical Garden and in the Rocky Mountain Herbarium.

A perennial herb usually 15–25 cm., rarely 30 cm. tall, creeping by rhizomes; stems usually branched at the base, finely pubescent with upwardly curved hairs, sometimes sprinkled as well with capitate glands; blades of lower deciduous leaves ovate, 1–2 cm. long, crenate-serrate, borne on petioles .5–1.5 cm. long, blades of upper leaves gradually diminished, ovate-elliptical, entire, the median 6–15 mm. broad, 15–35 mm. long, pubescent on both surfaces with upwardly curved hairs and sometimes glandular; flowers axillary, mostly disposed above the middle of the plant, borne on pedicels 3–4 mm. long; lower lip of calyx 3–4.5 mm. long at flowering, upper lip 5–6 mm. tall, at maturity, concave; corolla violet-blue, tube and galea 12–22 mm. long, lower lip with two lighter blotches on either side of the middle, closely appressed to the laterals, thus closing the orifice; lower stamens usually seated near the middle of the tube; nutlets black, verrucose, somewhat banded.

As pointed out above, *Scutellaria antirrhinoides* is distinguishable from *S. californica* predominantly by the position of the stamens within the corolla. It is distinguishable from *S. angustifolia* on similar grounds and also by the conformation of the corolla lips. It differs to a less extent by minutiae of pubescence and habit. The differences of the latter are not so great nor so readily perceived however, and in the absence of flowers these species might readily be confused. But even in size and structure the flowers of both species exhibit a degree of variation sufficient to cause confusion of some specimens and in one region plants commonly occur which are not certainly referable to

either. While *S. antirrhinoides* approaches *S. Austinae* and *S. angustifolia* very closely it is clearly distinct from the immediate allies of those species, *S. Brittonii* and *S. siphocampyloides*. The differences in foliage habit may be observed by reference to the chart. The flowers of these species, however, do not have the variability of *S. angustifolia* and hence the relative position of the lower stamens is always diagnostic. While the habit and pubescence of *S. antirrhinoides* are fairly stable the size of the corolla is variable throughout its range, although the proportions are generally fairly constant. There seems to be some correlation between the corolla size and certain geographic areas. While the galea and tube are commonly about 16 millimeters long, those from Nevada average about 18 millimeters and the lowland forms from Humboldt and Del Norte counties average about 20 millimeters.

In conformation the corollas of *S. antirrhinoides* are intermediate with *S. angustifolia* and its immediate allies on the one hand and *S. californica* and *S. Bolanderi* on the other. The extremes lean strongly in both directions.

*Scutellaria antirrhinoides*, the range of which is similar to that of *S. nana* but more extensive, has the widest distribution of any of the species treated herein, save *S. galericulata*. Except for the differences in flower size as indicated above, it is fairly stable throughout this range. In coastal Oregon and in California it occurs chiefly below 2000 feet, but in eastern Oregon, Nevada and Idaho it ranges to 5000 feet. The species flowers chiefly in June and July. The area where the greatest variation occurs is in northwestern California and adjacent southwestern Oregon, corresponding in part to Jepson's Tehaman area (Man. Fl. Pl. Calif. 12. 1925). The forms in which glandular hairs are abundant and readily perceptible with a hand lens seem to be confined largely to this area and usually occur with eglandular forms. Here also are to be found two anomalous forms, one in which the pubescence approximates that of *S. siphocampyloides* as it occurs in the coastal ranges of California, the other in which a plant with all the characteristics of *S. antirrhinoides* is combined with a flower scarcely separable from the smaller-flowered forms of *S. Austinae* in size, in conformation of the corolla and in the relative position of the lower filaments. A form similar to this intermediate and itself difficult of reference to either species, occurs in the vicinity of Ogden, Utah. Yet *S. Austinae* and *S. antirrhinoides* frequently flower side by side with apparently no hybridization.

Following is the distribution by counties: OREGON. Washington; Benton; Clackamas; Marion; Wasco; Lane; Curry; Josephine; Jackson; Klamath; Union; Baker; Grant; Harney; Malheur. IDAHO. Adams; Ada; Owyhee; Blaine; Butte. NEVADA. Humboldt; Elko; Pershing; Lander; Eureka. UTAH. Uintah Moun-



tains (!). CALIFORNIA. Del Norte; Humboldt; Mendocino; Lake; Sonoma; Siskiyou; Trinity; Shasta; Modoc; Plumas; Butte; Nevada; Placer; Amador.

Following are the localities of perceptibly glandular forms. OREGON. Josephine County: Grants Pass. Douglas County: Comstock. Klamath County: Rock Creek Lodge, west side Upper Klamath Lake. CALIFORNIA. Siskiyou County: Goose-nest foothills, Humbug Creek, Mount Shasta. Trinity County: Coffee Creek at Union Creek, Weaverville. Humboldt County: Trinity River at Willow Creek, Kneeland Prairie, Buck Mountain, Thrall, Shasta Valley.

Following are the localities of an anomalous form with pubescence similar to that of *S. siphocampyloides*. OREGON. Lane County: Spencer Butte. Josephine County: Rogue River near Grants Pass. Jackson County: High Cascade Mountains.

Following are the localities of an anomalous form intermediate with *S. Austinae*. OREGON. Harney County: Burns. Grant County: Hamilton. CALIFORNIA. Siskiyou County: Scott River Valley, Yreka, Cherry Creek, Klamathon, Humbug Creek. Shasta County: near Grisez's Mill. UTAH. Weber County: Ogden Canyon. Morgan County: Peterson Canyon.

8. *SCUTELLARIA ANGUSTIFOLIA* Pursh, Fl. Am. Sept. 412. 1814, based upon a specimen collected by Lewis and Clark along the Clearwater River near Kamiah, Idaho; the type is in the Academy of Natural Sciences at Philadelphia.

*Scutellaria veronicaefolia* Rydb. in Bull. Torr. Bot. Club 36: 681. 1909, based upon a specimen collected in Nez Perces County, Idaho along Peter Creek by Sandberg, MacDougal and Heller (no. 115); the type is in the herbarium of the New York Botanical Garden.

A perennial herb usually 15–30 cm. tall, creeping by slender rhizomes; stems usually branched at the base, generally appressed-hirtellous with ascending hairs, these less often replaced with spreading capitate glands; blades of the lowermost leaves ovate, subcrenate, 1–2 cm. long, borne on petioles .5–3 cm. long, those of the upper gradually diminished, entire, sessile, oblong-ovate or oblong, appressed-hirtellous with ascending hairs unless capitate-glandular, sometimes, at least the upper surfaces nearly glabrous; flowers axillary, borne on pedicels which are 5–6 mm. long at maturity; lower lip of calyx 4.5–5.5 mm. long at flowering, 5.5–7 mm. long at maturity, the squama then 4–5 mm. tall, concave; corolla deep violet-blue, its galea and tube 20–32 mm. long, arcuate below the middle, lower lip not appressed to the laterals unless at their bases; lower stamens seated somewhat above the middle of the tube; nutlets black, verrucose, sometimes lightly banded.

Three species immediately allied to *Scutellaria angustifolia*: *S. Brittonii*, *S. siphocampyloides* and *S. Austinae*, have usually been re-

ferred to that species as varieties. In conformation and size of the flower they are essentially identical. The flowers of *S. angustifolia* and *S. Brittonii* are apparently wider in the throat. The averages of measurements show no significant differences. However, they do present recognizable and quite constant differences in habit. Since this is true and since they occupy areas largely separate and have already been named, I have preferred to maintain them as species. The evidence of their distribution and morphology suggests that they would prove largely intersterile. Indeed, while the modes of *S. antirrhinoides* and *S. angustifolia* are much further apart than the modes of these four species, several forms exist which (as mentioned above) are intermediate and difficult to refer to either the first or to the second. Once learned, however, the minutiae of pubescence of these four species as well as the habit, serve to distinguish them. They apparently are not confluent in intermediate areas. The modes of variation of the nutlet patterns are apparently distinct but close, although an insufficient number of mature nutlets is available for a conclusive study. It is not improbable that adequate study of the species in nature would reveal differences more marked than is possible to observe in dried specimens. The range of variation in habit of the four species taken together is considerably greater than in any one of the other species discussed. The differences in habit may be expressed numerically by measurements of the median leaves, correlated with their shapes. Such averages are expressed in Chart 1.

*Scutellaria angustifolia* shows a marked variation in pubescence in which the usual eglandular appressed hairs are replaced by spreading capitate glands. These variants apparently occur in company with the other type and are restricted to an area in the drainage of the Snake River where Idaho, Washington and Oregon meet. The species flowers chiefly in May, June and July.

Following is the distribution of the species (in the United States by counties); in altitude its range lies largely below 2500 feet. BRITISH COLUMBIA. IDAHO. Boundary; Bonner; Kootenai; Latah; Nez Perce; Idaho; Adams; Payette; Boise; Canyon. WASHINGTON. Island; Okanogan; Stevens; Pend Oreille; Spokane; Chelan; Klickitat; Whitman; Walla Walla; Asotin. OREGON. Wasco; Polk; Sherman; Umatilla; Union; Wallowa; Baker; Grant; Wheeler; Crook; Deschutes; Lane. The glandular forms occur as follows. IDAHO. Nez Perce County: Peter Creek, Lewiston. Idaho County: Kamiah; Snake River (Willow Creek). OREGON. Wallowa County: Troy, Deep Creek (Snake River). WASHINGTON. Whitman County: Clarkston, Truax.

9. SCUTELLARIA BRITTONII Porter in Bull. Torr. Bot. Club 21: 177. 1894, based upon a specimen collected in Colorado in Clear Creek Cañon by Coulter; the type is in the herbarium of the Academy of Natural Sciences at Philadelphia.



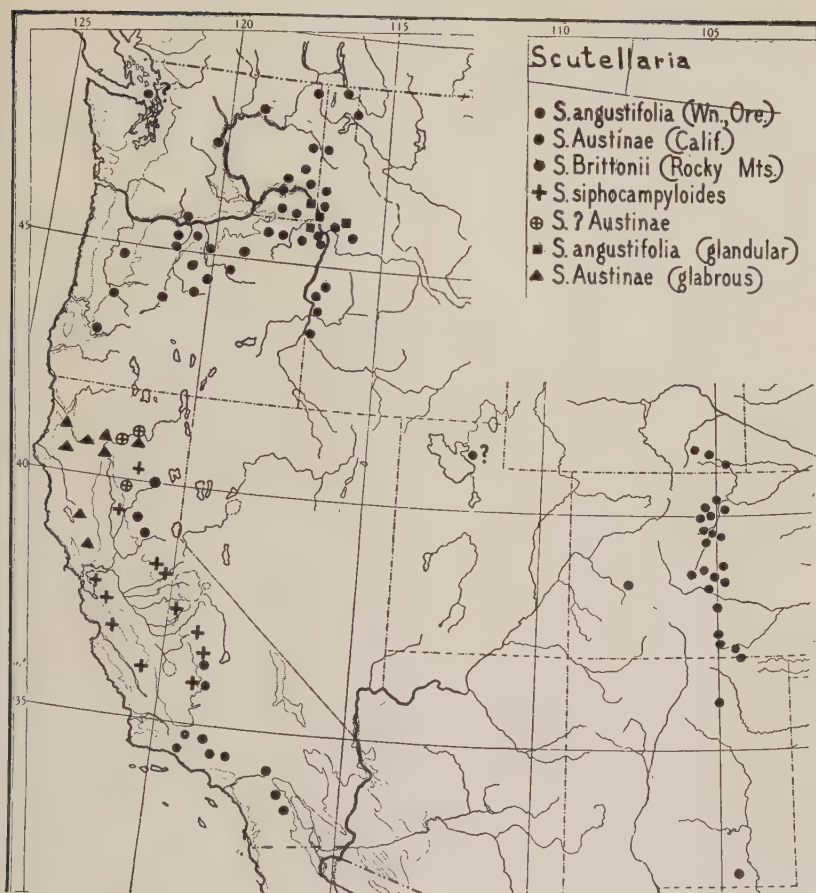


FIG. 2. Map showing distribution of *Scutellaria angustifolia* and its allies.

*Scutellaria virgulata* Nels. in Bull. Torr. Bot. Club 25: 283. 1898, based upon a specimen collected in Wyoming in the Laramie Hills by Nelson (no. 3218); the type is in the Rocky Mountain Herbarium.

*Scutellaria Brittonii* var. *virgulata* Rydb. in Fl. Colo. 296. 1906, based upon the same.

A perennial herb generally about 15 cm., rarely 30 cm. tall, spreading by rather thickish rhizomes; stems usually branched at the base, variously pubescent, nearly glabrous, puberulent with retrorse-appressed hairs or with upcurved curled hairs or with either one or the other of these types associated with spreading capitate glands; blades of the lowermost leaves oval, 8–15 mm. long entire, borne on petioles 3–5 mm. long, those of the upper

sessile, ovate-elliptical, entire, gradually diminished upwards, the median 17–35 mm. long, 6–12 mm. broad, entire, frequently somewhat revolute, both surfaces now nearly glabrous, now pubescent and more or less glandular; flowers axillary, borne mostly above the middle of the plant on pedicels 3–4 mm. long; lower lip of calyx 4.5–6.5 mm. long at flowering, 7–8 mm. long at maturity, the squama then 4–4.5 mm. tall, concave; corolla deep violet-blue, its tube and galea 23–32 mm. long, arcuate below the middle, lower lip glabrous, not appressed to the laterals unless at their bases; lower stamens seated somewhat above the middle of the tube; nutlets black, verrucose, banded.

From the accompanying diagram it will be seen that the proportions of the average median leaves of *Scutellaria Brittonii* are essentially those of *S. angustifolia*, although the average dimensions are materially different. As a general rule the veins of the leaves are more prominent and more often seven in number as indicated. The texture of the leaves is also different. Although the flowers of *S. Brittonii* and *S. angustifolia* are essentially identical in size and proportion, the latter is much more like *S. antirrhinoides* in pubescence and habit, than it is like *S. Brittonii*. The species flowers in May and June.

The species exhibits two pubescence varieties. The first of these is characterized by a clearly defined retrorse pubescence. The second (*Scutellaria virgulata*) has pubescence which while partly retrorse as seen under a compound lens, nevertheless curls upward to some extent. Both forms may be sprinkled with spreading capitate glands. The two forms are apparently not otherwise distinguishable, and commonly occur together throughout most of the range of the species.

The distribution by counties is as follows. WYOMING. Albany; Laramie. COLORADO. Larimer; Boulder; Gilpin; Jefferson; Denver; Douglas; Clear Creek; Park; Teller; El Paso; Fremont; Saguache; Huerfano; Garfield; Las Animas. NEW MEXICO. Colfax; Mora; Eddy.

10. *SCUTELLARIA SIPHOCAMPYLOIDES* Vatke in Bot. Zeit. 30: 717. 1872, based upon a specimen collected in California by Bridges; the type is in the herbarium of the Botanical Institute at Berlin.

*Scutellaria angustifolia* var. *canescens* Gray in Brewer and Watson, Bot. Calif. 1: 603. 1880, based upon three specimens. I consider that collected in the canyon of Pacheco Pass by Brewer (no. 1285) to be the standard. The others were collected by Bolander at the Geysers (no. 3947) and Mount Bullion (no. 4946).

A perennial herb generally 20–40 cm. tall, spreading by slender rhizomes; stems usually simple, rarely branching at the base, glandular with spreading capitate glands and pubescent with either ascending or retrorse hairs which are but little curled;

blades of lowermost leaves ovate or oval, subcrenate, 1-2 cm. long, borne on petioles .5-3 cm. long, soon deciduous, those other than the basal prevailingly oblong-elliptical, generally 2-3 cm. long, .5-1 cm. broad, subsessile, obtuse, entire or rarely subseriate, both surfaces softly pubescent with curled hairs and capitate glands; flowers axillary, generally borne above the middle of the plant on pedicels 3-5 mm. long; lower lip of calyx 4.5-5 mm. long at flowering, 5.5-7 mm. long at maturity, the squama then 4-4.5 mm. tall, concave; corolla deep violet-blue, its tube and galea 24-30 mm. long, arcuate below the middle, lower stamens seated somewhat above the middle, lower lip not appressed to the laterals unless at their bases; nutlets black, verrucose, obscurely banded.

While indistinguishable from *Scutellaria angustifolia* in respect to flower structure and proportions, *S. siphocampyloides* frequently resembles *S. californica* in habit. This is due to the generally oblong median leaf which is characteristic of both, as well as to a tendency for the lower leaves to be toothed. The species comprises two well defined and isolated geographic races. The first, which occurs in the foothills of the Sierra Nevada, is distinguished by the ascendent pubescence, characteristic of most of the group to which this species belongs. The hairs are longer, however, often twice as long as those of *S. angustifolia* or *S. Austinae*, and are more spreading. The capitate glands are seldom wanting and are well developed. As a result, the pubescence is much more noticeable, particularly under a lens, than in any other member of this group. The second form, found in the Coast Ranges south of San Francisco Bay, has essentially the same pubescence but it is clearly retrorse, comparable to that of *S. Brittonii* but of a different texture. As previously pointed out, an anomalous form of *S. antirrhinoides* with much the same pubescence is known in southwestern Oregon. A form from Tulare County has reduced pubescence scarcely separable from that of *S. angustifolia*.

This species occurs within the oak woodland chiefly below 2000 feet, in rocky soil and in gravelly dry stream bottoms. It flowers chiefly during May, June and July. It is distributed as follows. CALIFORNIA. Plumas County: Prattville, Butt Creek. Tehama County: Mineral. Butte County: Butte Meadows, Chico Meadows. Sutter County: Marysville Buttes. Placer County: Stillwater. Amador County: Ione. Calaveras County: Mercer's Cave, Reservoir, Angels Camp, Milton, Wallace, North Fork Calaveras River near San Andreas, Harman Peak. Tuolumne County: Sonora, Harden Ranch, Big Oak Flat road, Taylor Hill, Spring Gulch near Bear Creek. Mariposa County: Mount Bullion, Greeley Hill above Coulterville. Fresno County: Pine Ridge, Trimmer's Springs, Big Sandy Creek, Tollhouse, Badger. Tulare County: Homer's Nose (Sequoia Forest), Middle Tule



River, Paradise Ridge, Kaweah River. Alameda County: Mocho Creek, Cedar Mountain, Oakland Hills, Hayward. Santa Clara County: Coyote Creek, Pacheco Pass, Gilroy, Isabel Creek (Mount Hamilton). San Benito County: Hernandez.

11. *SCUTELLARIA AUSTINAE* Eastw. in Bull. Torr. Bot. Club 30: 493. 1903, based upon a specimen collected in California in Butte County along Big Chico Creek by Mrs. Bruce (no. 1835); the type is in the Herbarium of the California Academy of Sciences; isotypes are in the herbarium of the University of California.

*Scutellaria linearifolia* Eastw. loc. cit., based upon a specimen collected at "San Diego," California by W. J. Fisher (no. 586); the type is in the herbarium of the California Academy of Sciences.

A perennial herb generally 10–30 cm. tall, spreading by slender rhizomes; stems usually branched at the base either entirely glabrous or puberulent with small ascending curved hairs; blades of lowermost leaves oval or oblong, on petioles about equal in length, soon deciduous, those of all but the basal, oblong-elliptical or linear, obtuse, entire, either wholly glabrous or puberulent with small ascending curved hairs, prevailing 1.5–3 cm. long, 3–6 mm. wide, subsessile; flowers axillary, disposed above the middle of the plant, borne on pedicels 3–5 mm. long; lower lip

#### EXPLANATION OF CHART 1

CHART 1. Drawn to scale are figures in which it is sought to indicate the range in habital variation in seven closely related species. As has been pointed out in the text the vegetative parts of one species may readily be confused with those of another in the absence of flowers, or conversely, in the absence of foliage, the flowers of some are difficult to differentiate. The rectangles show for each species indicated the minimum, average and maximum sizes of median leaves. The dotted lines indicate the standard deviation from the mean expressed by the solid lines. Measurements were made upon a varying number of dried specimens. The data involved are as follows:

Table 1. Lowermost floral leaf (approximately median) in millimeters

|                                | N = | Maximum<br>length | Average<br>length | σ length | Minimum<br>length | Maximum<br>width | Average<br>width | σ width | Minimum<br>width |
|--------------------------------|-----|-------------------|-------------------|----------|-------------------|------------------|------------------|---------|------------------|
| <i>S. californica</i> .....    | 82  | 31                | 18.5              | 4        | 11                | 11               | 7                | 1.8     | 4                |
| <i>S. Bolanderi</i> .....      | 51  | 42                | 25.5              | 6        | 10                | 26               | 13.5             | 3.5     | 9                |
| <i>S. antirrhinoides</i> ..... | 106 | 28                | 17                | 3.8      | 10                | 14               | 6                | 2.1     | 2.5              |
| <i>S. Austinae</i> .....       | 94  | 37                | 22                | 5.5      | 12                | 7.5              | 3.7              | 1.1     | 2                |
| <i>S. Brittonii</i> .....      | 74  | 37                | 24.5              | 5        | 16                | 15               | 8                | 2       | 5                |
| <i>S. siphocampyloides</i> ..  | 40  | 44                | 28                | 6.2      | 15                | 10               | 5                | 1.5     | 3                |
| <i>S. angustifolia</i> .....   | 86  | 32                | 21                | 4.2      | 12                | 11               | 6.4              | 1.5     | 3.5              |

The averages of the last four named are contrasted in figure A. The averages for the three geographical forms of *S. Austinae* are shown above that name. The average shapes of the leaves of the four last named species are indicated by the outline drawings.

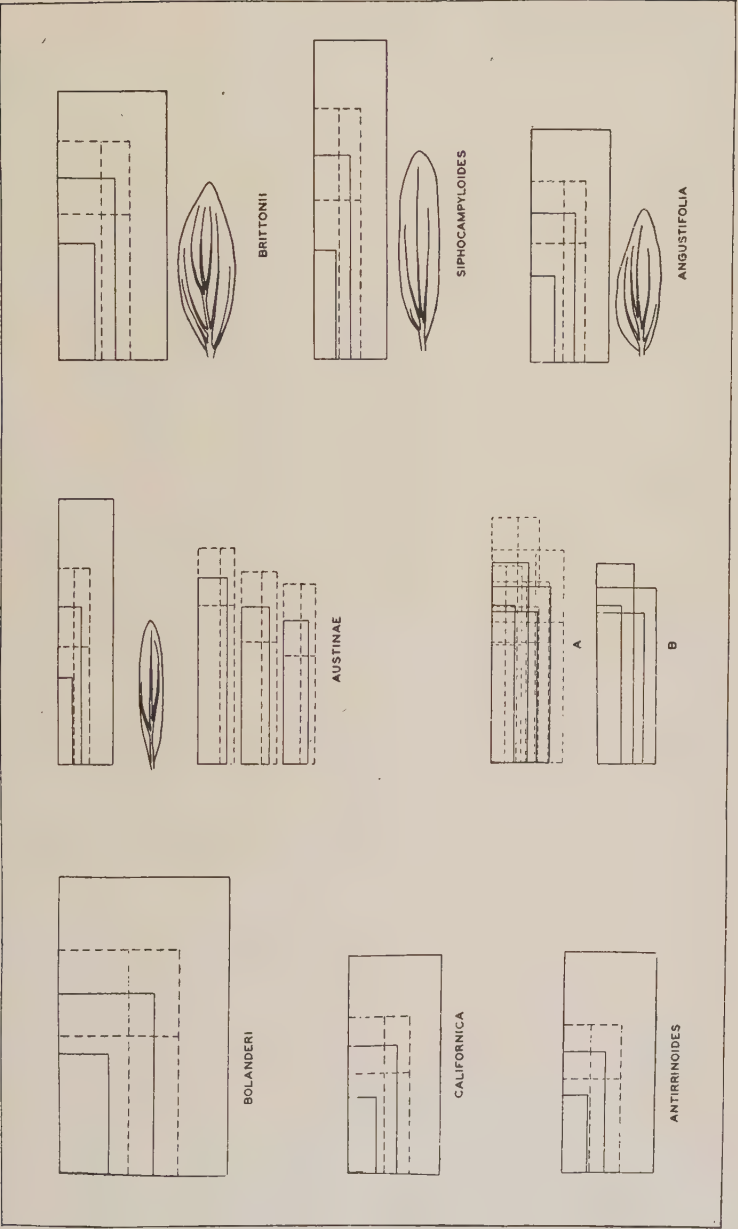


CHART 1. Diagrammatic representation of median leaf variation in *Scutellaria*.

of calyx 4.5 mm. long at flowering, 5–6.5 mm. long at maturity, the squama then 3.5–4.5 mm. tall, concave; corolla deep violet-blue, its tube and galea 23–29 mm. long, arcuate below the middle, lower lip not appressed to the laterals unless at their bases; lower stamens seated somewhat above the middle of the tube; nutlets black, verrucose, obscurely banded.

This species is most like *Scutellaria angustifolia*, differing chiefly in habit. The pubescence, when viewed in a large number of specimens, is seen to be essentially that of *S. antirrhinoides* but not very different from *S. angustifolia*. It is not at all glandular or rarely so. The habit of the whole plant may be expressed in the averages of the median leaves as shown in the chart. While essentially of the same shape as those of *S. siphocampylodes*, they are materially narrower. The species exists in three more or less segregated areas each of which is characterized by a form peculiar to it. The plants of the North Coast Ranges are quite glabrous and the proportions of the median leaves are of a definite order. Somewhat puberulent forms are infrequent. In the northern and central Sierran foothills occurs a second form, the typical (nomenclatorially). It is puberulent with a pubescence very like the eglandular forms of *S. antirrhinoides* and its median leaves average less in length and in width. In the southern Sierras and especially in the mountains of southern California is a third form (*S. linearifolia*) with similar pubescence, but with even narrower and shorter leaves; the whole plant is smaller.

#### EXPLANATION OF CHART 2

CHART 2. Drawn to scale are figures representing the maximum and minimum sized corollas of nine species. The conformation of the corollas as shown here is diagrammatic and is not significant. As shown elsewhere, those in the left-hand row are very similar in conformation and are characterized by a closed throat. Those in the right-hand column are likewise similar and are characterized by an open throat. In the case of *S. Bolanderi* it will be seen that the minimum corolla of subsp. *typica* is larger than the average of subsp. *austromontana*.

The quadrangles accompanying each are diagrammatic averages of the corolla sizes, indicating length and breadth together with the points of attachment of the stamens. In the case of *S. Bolanderi* figure A represents subsp. *austromontana*, figure B subsp. *typica*. In the case of *S. Austinae* figures C, B and A represent, respectively, the north coast form, the Sierran form, the southern form. It will be observed that while the corolla of the first named form is comparable to those of the three species immediately allied, the average is smaller. This may be due in part to the greater number of southern forms available for measurement. The variation in the width of the throat of these four species may be observed, as well as the variation in place of stamen attachment. In the case of *S. tuberosa* figure A represents subspecies *similis*, figure C subspecies *australis* and figure B the intermediate forms. The differences in stamen arrangement between the subspecies is readily perceived. The data were obtained from boiled corollas; they were partly substantiated by field observation. The number of corollas involved in making the diagrams is as follows: *S. Austinae*, southern form (A) 20, Sierran form (B) 5, north coast form (C) 7, the average of all (D) 32; *S. siphocampylodes* 15; *S. angustifolia* 20; *S. antirrhinoides* 46; *S. nana* 15; *S. tuberosa* subsp. *similis* (A) 18, intermediate forms (B) 15, subsp. *australis* (C) 14; *S. Brittonii* 13; *S. californica* 41; *S. Bolanderi* subsp. *austromontana* (A) 7, subsp. *typica* (B) 7.



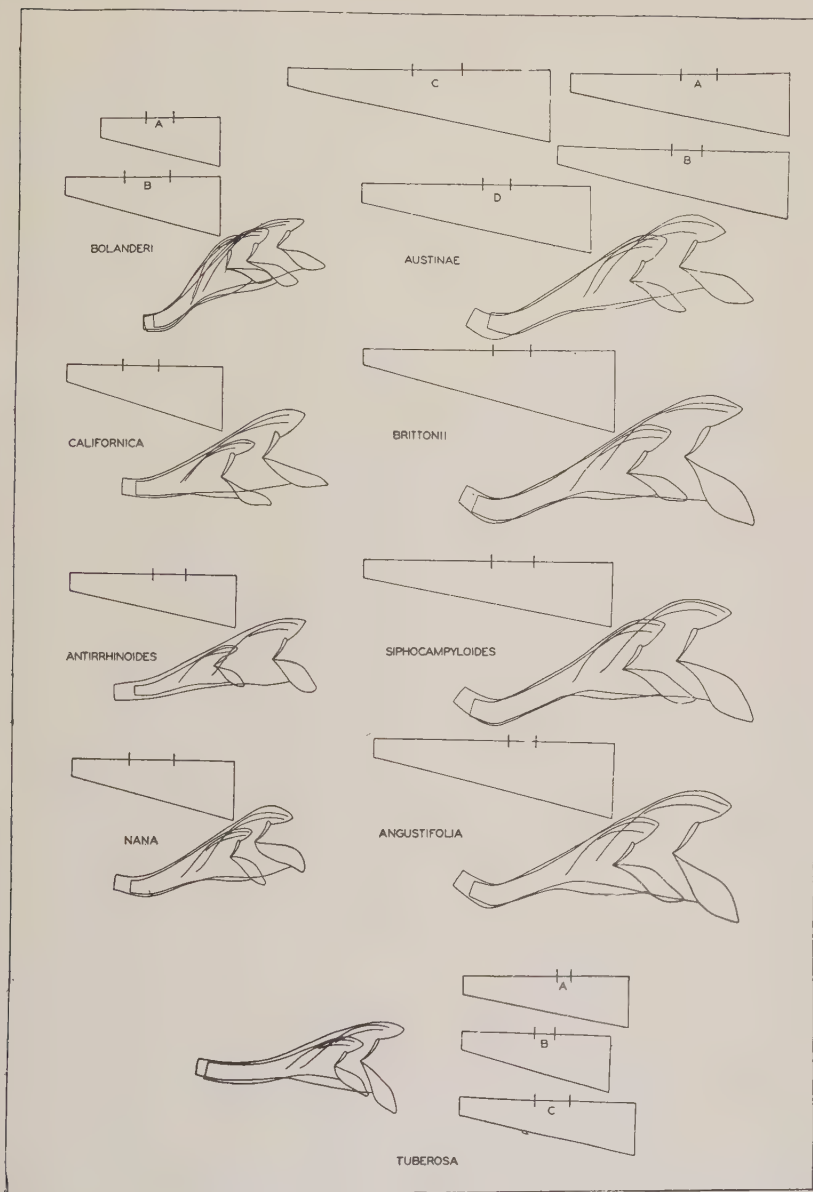


CHART 2. Diagrammatic representation of size variation in corollas of *Scutellaria*.

The averages of these forms may be seen by reference to Chart 1. In flower structure and size the species is not materially different from *S. angustifolia*.

The species occurs on dry, usually stony banks or in gravel, frequently along the dry margins of streams and is found chiefly in association with the drier aspects of the yellow pine forest. Its westward limit corresponds to the western limit of yellow pine in Humboldt County. Although the type was collected along Chico Creek, presumably under oaks, it seldom ranges into the oak woodland. In the Sierra Nevada and North Coast Ranges it seldom occurs above 2500 feet. In southern California it occurs chiefly from 3500–5000 feet. It flowers chiefly during June and July.

Following is the distribution by counties: CALIFORNIA. Humboldt; Trinity; Shasta; Tehama; Lake; Napa; Butte; Plumas; Nevada; Yuba; Tulare; Kern; Ventura; Los Angeles; San Bernardino; Riverside.

University of California at  
Los Angeles, July 1, 1938.

## CONE VARIATION IN DIGGER PINE

W. PALMER STOCKWELL

*Pinus Sabiniana* Dougl., the digger pine, is quite constant in its general appearance, having a forked or loosely branched crown, sparse gray-green foliage and often a leaning posture. The cones are dark, the seeds are large and the seed wings are short and thick. However, the degree of variation in cone size and morphology exhibited by this pine is approached by few others.

In central and northern California the cones of digger pine often resemble those of Coulter pine in size and general conformation, with hooked spurs as long as two inches from some of the basal scales. Toward the southern end of its range, however, and near the coast, colonies of digger pine are known that produce cones of an entirely different appearance. These cones are short, broad based, massive, woody, carved in appearance, and the scales are tipped with short, heavy down-turned spines. The general aspect of the cone is similar to that of Torrey pine; so striking is this resemblance, in fact, that the botanist may suspect that these two species have been associated in the past, although there is no overlapping of their ranges at the present time.

Variation of cone size is as great as variation of cone form in the digger pine. In May, 1938, the writer, accompanied by H. L. Mason, visited a colony of large-coned trees near Bartlett

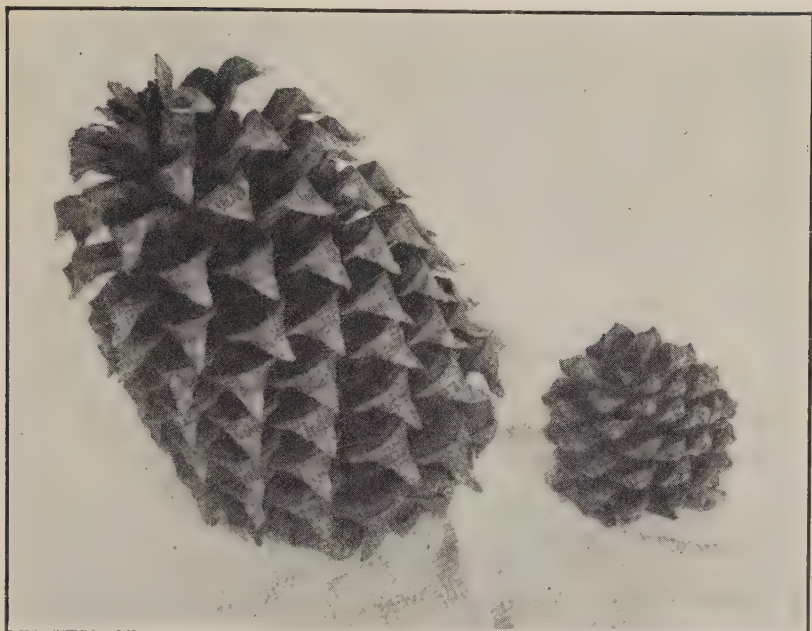


FIG. 1. Size variation in digger pine cones. The large cone is typical of the strain found growing near Bartlett Springs; the small cone represents that which occurs on Figueroa Mountain.

Springs, Lake County, California. Many old open cones gathered from the ground were between ten and twelve inches long and one of these measured thirteen inches from the lowest scale to the apex and was seven and three-fourths inches in diameter. This cone, thoroughly dry and empty of seeds, with the peduncle and some of the basal scales missing, weighed two pounds, ten ounces. At the other extreme of size range are old, open cones recently collected at a location reported by Carl Epling on Figueroa Mountain, Santa Barbara County, California. In general these are short and broad, one of them measuring three and three-fourths inches in length, three and one-half inches in diameter at the base, and weighing but four ounces. These examples are not of rare individual cones or of isolated trees, but of local races or genetic strains represented by many trees, a fact which emphasizes their importance to an understanding of species distribution and delineation in the western pines.

California Forest and Range  
Experiment Station, Berkeley,  
September, 1938.



ALICE EASTWOOD'S EIGHTIETH BIRTHDAY  
ANNIVERSARY

Miss Alice Eastwood, for forty-seven years Curator of Botany of the California Academy of Sciences, celebrated on January 19, 1939, her eightieth birthday. To honor her on this occasion more than four hundred botanists and garden enthusiasts met at a luncheon held in the Terrace Ballroom of the Fairmont Hotel, San Francisco. Following the luncheon Dr. F. M. McFarland, president of the Academy, presided at a brief congratulatory ceremony. A resolution by the board of trustees in appreciation of Miss Eastwood's devoted service to botany as curator in the institution was read by Mr. Norman B. Livermore, president of the board. Miss Eastwood received hundreds of congratulatory letters and telegrams; excerpts from a few of these were read by Dr. Robert C. Miller, Director of the Museum and Steinhart Aquarium of the Academy. Among the valuable gifts received by Miss Eastwood was a collection of the Dennison wild flower paintings presented by Mrs. J. T. Morris and Miss F. P. Morrison. She received also a book plate, the gift of the California Botanical Club, an organization which she founded in 1891. The plate, designed by Mrs. Alice B. Chittenden, shows redwoods and manzanita in the foreground, and in the distance Mount Tamalpais, one of Miss Eastwood's favorite collecting fields. Mr. Allen B. Chickering expressed the regard and esteem of Miss Eastwood's many devoted friends and admirers and, in appreciation of the work she has accomplished in the crowded quarters of the Academy, offered to contribute the sum of two hundred and fifty dollars as the beginning of a fund for a building to be known as the "Alice Eastwood Herbarium." Miss Eastwood made acknowledgments in a characteristic short speech quoting the verse, "My Birthday," by Dixie Lee which ends:—"I count my age by friends—not years!"

Flowering manzanita (*Arctostaphylos manzanita*) from the William F. Booth place in Sonoma County was used for table decoration. For many years Miss Eastwood has been especially interested in the native Californian species of this genus and its use on this occasion was especially appropriate.

Among organizations represented at the luncheon were: American Fuchsia Society, California Academy of Sciences, California Horticultural Society, California Spring Blossom and Wild Flower Association, San Francisco Garden Club. An attractive biographical folder, sponsored by these organizations, was distributed as a souvenir.

The accompanying portrait of Miss Eastwood was taken in January, 1939.—ETHEL CRUM, Department of Botany, University of California, Berkeley, February, 1939.



PLATE 7. ALICE EASTWOOD.





## A NEW SPECIES OF ARTHROBOTRYUM

RUTH A. HOERL

A collection of *Arthrobotryum* by Mr. Harold E. Parks, from Smith River Valley, Del Norte County, California, represents an undescribed species. Specimens of the fungus were sent in April, 1933, to Dr. Lee Bonar of the University of California, Berkeley, who suggested and directed this study. The writer is indebted to Mr. Parks for subsequent collections and field observations, which have shown that the fungus is continuously present in this area.

*Arthrobotryum spongiosum* sp. nov. Mycelium copiosum, compactum massis spongiosis sed densis; hyphae fuscae, profuse ramosae, compactae cellis fere globosis, 10–30  $\mu$  diametro; synnemata sparsa, nonnumquam absentia, ferme 1 mm. alta, fusca, composita ex pluribus conidiophoris filiformibus dense compactis; capitula globosa, conidia dilute brunnea, cylindrata-ovoidea, 3-septata, leviter stricta ad septas, 32–44  $\times$  10–16  $\mu$ .

Mycelium abundant, composed of spongy but dense masses; hyphae dark, profusely branching, composed of cells almost spherical, 10–30 microns in diameter; synnemata sparse, sometimes absent, averaging 1 mm. high, dark brown, composed of

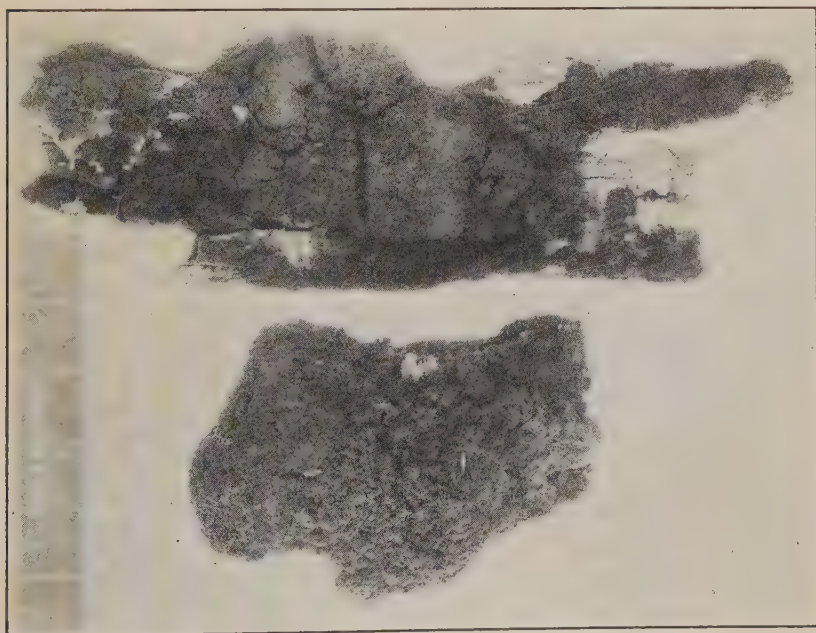


FIG. 1. *Arthrobotryum spongiosum* Hoerl. On bark of *Libocedrus decurrens* Torr.,  $\times 1$ .

many closely compacted parallel conidiophores; heads globose, conidia pale brown, cylindric-ovoid, 3-septate, slightly constricted at septae,  $32-44 \times 10-16$  microns.

Habitat: on twigs and branches of *Libocedrus decurrens* Torr., *Chamaecyparis Lawsoniana* (Murr.) Parl., and *Pseudotsuga taxifolia* (Poir.) Rehder.

Type: on *Libocedrus decurrens* Torr., above Eighteen Mile Creek, Smith River, Del Norte County, California, April 19, 1933, Harold E. Parks 4422 (U.C. Herb. 596853).

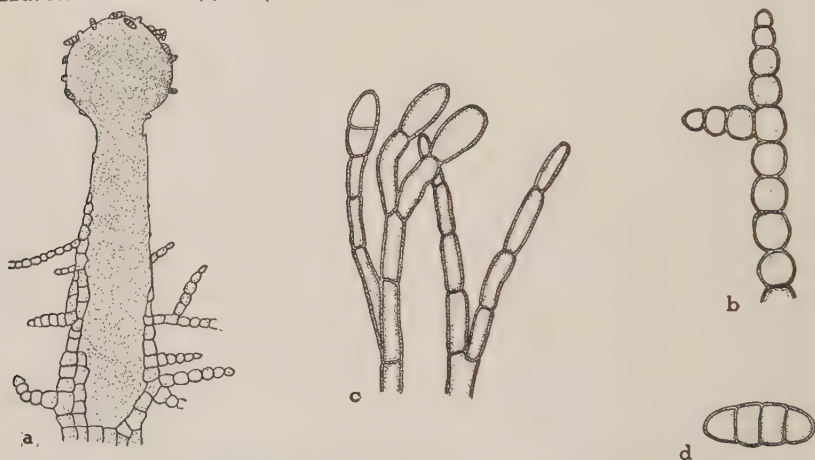


FIG. 2. *Arthrobotryum spongiosum* Hoerl. a, synnema,  $\times 50$ ; b, detail of branching hypha,  $\times 430$ ; c, detail of conidiophores and immature conidia,  $\times 430$ ; d, mature conidium,  $\times 430$ .

In most of the described species of *Arthrobotryum* the superficial vegetative mycelium is sparse and the synnemata are numerous and gregarious. In this species the opposite situation exists. The outstanding characteristic of the fungus is the thick mat of superficial growth. The mycelium forms compact, black, irregular, often more or less confluent masses which are one-half to three-fourths of an inch in depth, and which extend over the branches, giving a general blackened appearance (text fig. 1). Fruiting bodies are scattered and not numerous, and in some collections are entirely lacking. Although the synnemata rise from the surface of the mat, they are not easily seen with the naked eye because of their small size and the spongy uneven character of the mycelium.

The superficial mycelial mats tend to fall away during the dry season. Conclusive evidence has not been found to indicate that hyphae penetrate into living tissue of the host, and no injury to the tree is apparent.

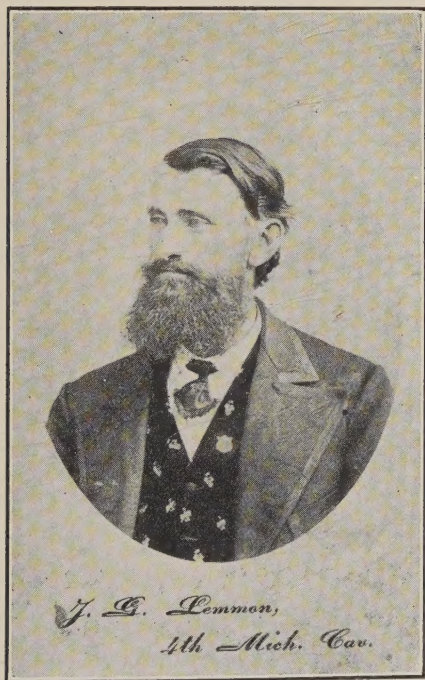
The genus *Arthrobotryum* has a wide distribution. Species have been described from Italy, Holland, Germany, England,

India, Ceylon, Borneo, Cuba, Porto Rico, and New Jersey. *Arthrobotryum spongiosum* approaches *A. atrum* Berk. & Broome, a European species, in spore size, but other characters widely separate the two species.

University of California,  
Berkeley, March, 1938.

### A PORTRAIT OF JOHN GILL LEMMON

The accompanying photograph of John Gill Lemmon was given to me by Mrs. Stacy Slipner of 3241 Broadway, Sacramento, California. Mrs. Slipner, who was born in Sierra County, California, in 1859, was a pupil of Mr. Lemmon's in the seventies. Her reminiscences regarding the Lemmon family are summarized in the following statements:



Frank Lemmon was farming in the Sierra Valley during the Civil War. After the war, his brother John, another brother (Judge William Lemmon), and a sister (Mrs. Olson) joined him in California. John had served in the Union Army; Mrs. Olson, also, had served the Union cause by working in hospitals. John had been a prisoner of the Confederates [in Andersonville] and had been subjected to severe physical and mental strain. He became the school teacher in Sierra Valley. He was a good teacher, popular with children and parents. Mrs. Lemmon was also a botanist; she was a Californian, but not from the mountains.

Mrs. Slipner's reminiscences convey an impression of a gentleness which might not be expected in the grimly bearded veteran.

The photograph, beneath which is printed the legend "J. G. Lemmon, 4th Mich. Cav.", bears on the reverse the imprint of a San Francisco photographer. It was evidently made not long after the war, but there is no definite information as to its date. —HERBERT F. COPELAND, Sacramento Junior College, Sacramento, California, January, 1939.



## REVIEW

*Phytogeographical Problems of Eastern Canada.* By FRÈRE MARIE-VICTORIN. Contributions du Laboratoire de Botanique de l'Université de Montreal, Number 30. American Midland Naturalist. Volume XIX, Number 3. Pp. 498-558. The University Press, Notre Dame, Indiana. 1938.

This study has arisen from the keen observations of a veteran field botanist, who has spent many years exploring the flora of one of the more interesting regions of North America. As its title implies, the contribution aims chiefly to state certain important ecological and phytogeographical problems, solutions of which are either not offered or are suggested only as tentative hypotheses. The first problem is that of the occurrence in nature of variations which appear similar to the geneticist's mutations, and of the existence in such genera as *Crataegus* and *Oenothera* of many closely interrelated microspecies. The author concludes that many of these microspecies must have originated since the advent of civilization, but does not discuss the cytogenetic basis for their existence. He considers them important as "traces of discontinuous evolution." The principal problem discussed by the author, however, is that of the allogenous elements in the flora of eastern Quebec; those species, either endemic or isolated outliers of characteristically Arctic or Cordilleran species, which persist as relics on the higher mountains, the river gravels, and the exposed shores of the Gaspé Peninsula, the Mingan Islands, and the Island of Anticosti. The author gives careful lists and descriptions of many of these species and their habitats, accompanied by a fine series of illustrations and maps, which speak eloquently for the thoroughness with which he has studied this flora during a period of more than twenty-five years.

As a result of his extensive studies, Victorin has concluded that neither of the two principal hypotheses which have been put forward to account for the presence of these allogenous elements is wholly adequate. He gives careful consideration to the hypothesis of Fernald, that they are relics which have persisted in their present localities throughout the Wisconsin glaciation. This hypothesis seems clearly applicable to many of the Gaspé species, but in Mingania and Anticosti Island, the presence of a lobate ice front must be postulated, with the relic species occurring in an ice-free area between the lobes. This view is supported by the localization of the allogenous elements in areas of the south shore of Anticosti that correspond in a certain degree to the portions of the Mingan Islands also occupied by such species. No geological evidence in favor of this supporting postulate is presented. Another difficulty with Fernald's hypothesis is that many of the river gravels of the south side of the Gaspé Peninsula, which is unquestionably glaciated, contain as many allogenous species endemic to these lowlands as do the unglaci-

ated highlands of the Gaspé. Finally, there is "a number of bi-centric species rather general or frequent on the lower St. Lawrence area whose Cordilleran or Asiatic affinity or identity must be accounted for." To account for these discrepancies the hypothesis of post-glacial migration, recently revived by Wynne-Edwards, is brought up by Victorin. He does not, however, feel that this hypothesis can account for all of the allogeous species, and mentions the interesting fact that many of them, when cultivated in Montreal, show great vegetative vigor and "aggressiveness." The thoughtful reader cannot finish this most interesting discussion without agreeing that "the situation seems much too complex for one good simple, schematic and dogmatic explanation." One can only hope that the author will continue these studies and will eventually reach a solution satisfactory for the explanation of at least the main features of this fascinating problem.—G. LEDYARD STEBBINS, JR.

### NOTES AND NEWS

NEW RECORDS OF ALIEN PLANTS IN SAN DIEGO COUNTY, CALIFORNIA. Most of the species listed below are here reported from southern California for the first time. I am indebted to Dr. I. M. Johnston, Dr. P. A. Munz, and Mr. J. R. Swallen for some of the determinations. Stations given are in San Diego County, and specimens cited are in the herbarium of the San Diego Natural History Museum.

CENCRUS ECHINATUS L. La Mesa, October 20, 1937, *Gander 4637*. Not previously reported from California.

PENNISETUM RUPPELII Steud. An occasional escape in waste areas: San Diego, March, 1931, *Fidella G. Woodcock*; May 10, 1936, *Gander 1852*.

PHYTOLACCA AMERICANA L. Chula Vista, July 25, 1936, *D. F. Howe*. Reported by S. B. Parish from Santa Monica, Los Angeles County (*Zoe* 2: 27. 1891).

SISYMBRIUM ORIENTALE L. Widely established in the vicinity of San Diego: Balboa Park, April 16, 1929, *Miss F. G. Woodcock*, March 31, 1937, *Gander 3067*; Chollas Heights, April 27, 1937, *Gander 3883*; San Luis Rey, *Gander 3333*, Oceanside, April 15, 1937, *Gander 3271*. Reported once previously from the United States (*Leaff. West. Bot.* 1: 174. 1935).

RESEDA LUTEOLA L. Poway, May 26, 1936, *Gander 2415*. Not previously reported from southern California.

KALLSTROEMIA PARVIFLORA Norton. Well established in a small area near Warner Hot Springs, October 22, 1936, *Gander 2944*. Not previously reported from California.

CHRYSANTHEMUM CARINATUM L. Silver Strand near Tent City, April 25, 1936, *Gander 1603*.—FRANK F. GANDER, Natural History Museum, San Diego, California.



Members who plan to bind Volume IV of MADROÑO should note that the portrait of Dr. Willis Linn Jepson in the October, 1938, issue is the frontispiece. The inadvertent transposition by the printers should be corrected by inserting the portrait to face the title-page.

The Sixth Pacific Science Congress of the Pacific Science Association will be held July 24 to August 12, 1939, at the University of California, Berkeley, Stanford University and the Golden Gate International Exposition, San Francisco. Inquiries regarding the Congress may be addressed to the secretary of the committee on the Sixth Pacific Science Congress, 205 Hilgard Hall, University of California, Berkeley, California.

On Sunday, February 5, 1939, the Santa Barbara Branch of the California Botanical Society held a dinner meeting at French Hotel, Santa Barbara. Mr. C. A. Harwell, Park Naturalist, Yosemite National Park, spoke on the development of natural history work in Yosemite National Park since 1916. Twenty-four members of the Society attended the meeting.

Recent articles of especial interest to botanists in western North America are: "The American species of *Crepis*," by E. B. Babcock and G. L. Stebbins, Jr. (Carnegie Inst. Wash. Publ. No. 504: 1-199, figs. 1-34. 1938); "The *Styrax* of northern California," by Herbert F. Copeland (Am. Jour. Bot. 25: 771-780. 1938); "The North American species of *Rhamnus*," by Carl B. Wolf (Rancho Santa Ana Botanic Garden, Bot. Ser. 1, 1-36. 1938); "A synopsis of the North American species of *Sorbus*," by George Neville Jones (Jour. Arn. Arb. 20: 1-43, pls. 226, 227. 1939).

Fascicles of "Flora Taxonomica Mexicana," by Professor C. Conzatti are now appearing. Part II, "Mexican Ferns" (consisting of 250 pages), may be purchased separately for four Mexican pesos, or together with Part I, the "Analytical Key of Families," for five Mexican pesos. Address: Professor C. Conzatti, 2a de Gomez Fariás, 3 Oaxaca de Juarez, Oaxaca, Mexico.

The first issue of *Lloydia*, A Quarterly Journal of Biological Science, appeared January 7, 1939. This new periodical, edited by Dr. Theodor Just, is the official publication of the Lloyd Library of Natural History, Cincinnati, Ohio. The format is especially attractive, the paper is of excellent quality, and the print is clear. The issue consists of 254 pages and is well illustrated and conveniently indexed. The content is divided between the fields of botany and entomology. The botanical articles are: "The morphology of *Artemisia tridentata* Nutt." by R. A. Dietert; "Revision of *Horkelia* and *Ivesia*," by David D. Keck; "The genus *Eucrypta* Nutt." by Lincoln Constance; "Tropical *Dacrymycetaceae*," by Travis W. Brasfield; "The *Cladoniae* of eastern Kentucky," by Margaret Fulford.—E. CRUM.